https://dx.doi.org/10.22161/ijaers.4.2.31 *ISSN: 2349-6495(P) | 2456-1908(O)*

Factors Affecting the Innovation and Competitiveness in Kurdistan Region of Iraq Construction Industry

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***Abstract*—** *Innovation is the process of creating and implementing new ideas for the community, while competitiveness is the ability of a firm to provide the community standard quality services at competitive costs. Creativity and innovation have always been recognized as the foundation of success of any organization, as is the case for the construction industry worldwide. However, without taking the competitiveness in consideration, the prosperity process would be difficult.*

Over the past decade, the construction industry has been grown dramatically in Iraq, especially in northern region of the country. To keep the industry firms on the success path by way of making them innovative and competitive, examining factors affecting innovation and competitiveness is crucial. With this aim, this research is conducted so as to identify the factors influencing innovation and competitiveness of the firms.

Literature review about innovation and competitiveness was reviewed to identify the factors affecting the innovation and competitiveness of construction projects. Pilot study of the questionnaire was achieved by a scouting sample. A questionnaire survey was conducted and 43 factors were identified, categorized into 7 groups of dimensions: 1) input, 2) driver, 3) barriers, 4) enabler, 5) impact, 6) competitiveness, and 7) firm's need of innovation. 150 questionnaires were distributed on local construction firms. 85 questionnaires were received (57%).

Four hypotheses addressing the improvements of firm's project performance and their competitive advantages are developed, a conceptual framework explaining the developed hypotheses are designed, ended up with recommendations to improve innovation, competitiveness and performance of construction projects in Kurdistan Region of Iraq.

Keywords*— *Competitiveness, Construction firms, Innovation, Kurdistan Region of Iraq Construction Industry.

I. INTRODUCTION

Innovation is a key way of reasonable advantage for construction companies. The focus is to make a company more innovative generally. The construction companies, which effectively innovate in a repeatable style, share one common thing which they're good at managing change [1]. The innovation in construction is progressively seen as a process that growths the competitive position of company by improving the extensive range of modern thoughts as stated in [2].

According to a policy perspective, competitiveness is considered a multidimensional issue and a balanced multidisciplinary approach, which is necessary through practicing in the production system can increase quantitative methods [3]. Competitiveness in construction is no longer regarded completely at national or international level, but nowadays is recognized as having a global dimension as well. The topic competitiveness is gradually becoming essential with the assistance of globalization [4]. At the same time, companies are innovating for competitive advantage. Most of the studies show that the old-style dimensions such as price, quality, services, etc. do not have sufficient associations to get the competitive representation subjects for the existing competitive environment [5]; [6].

By the vanishing of protective tendencies on world trade, there has been a growth in the exporting countries as well as the exported products and also the likeness of consumption forms along with globalization has also increased the world trade. Thus, as many countries have been producing and exporting the same products, the international competition has become indispensable. Inside this powerful competitive environment, the need to produce highly competitive products has initiated to create novel products or to develop the existing products, which is called the process of innovation [4].

The achievement of effective building practices can lead to positive competitive advantages such as: 1) costs saved from undesirable reduction plans, 2) improving human progress, 3) recovered labor performance by reducing the

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risks regularly related with unsafe construction places, and 4) increasing the income from developed models, developed market agreements and upsurge in duplication businesses ([7]). A questionnaire survey in the UK in some construction industries found that un-sustainability strategy and actual reportage to stakeholders can assist increase contractors' reputation and business competitiveness ([8]).

Innovation management is ultimately considered the management of innovation processes. It mentions to both of product and organizational innovation. Innovation management contains a set of tools that help managers and engineers to collaborate with an exact understanding of processes and to achieve the goals [9].

Management innovation includes the forefront of originality in an instituted organization, and it symbolizes a specific compose of organizational alteration ([10]). Additionally, commercial organization that emerges revenue basis and donate in selling belongings or facilities to consumers is called business firms. The management of a commercial firm will typically grow a set of organizational objects and devices for meeting those targets to help employees understand where the corporation is overseen [11].

II. PROBLEM STATEMENT

Project failures come from many reasons and factors but mostly from problems and failures in performance [12]. After the Iraq war in 2003, construction industry has grown significantly in Iraq, particularly in the northern region, due to a high demand of construction needed for the region starting from the infrastructure to high buildings and very large residential complexes. However, many of the construction firms in the region fail in performance. Furthermore, failure measurement systems are not handy to identify the problems. In Kurdistan Region of Iraq, construction project issues appear in different ways: there are failures due to barriers such as lack of technology and experienced staffs, while others fail in time, performance, and others fail due to discouraging innovation and loss of competitiveness. Consequently, to identify these issues and suggest solutions, this research is conducted so as to investigate the factors affecting innovation and competitiveness for construction firms in the region.

III. RESEARCH QUESTIONS AND OBJECTIVES

The objective of this study is to investigate the factors affecting the competitiveness and innovation in construction industry in Kurdistan Region of Iraq so as to analyze and identify factors having negative effects on the project performance and firms' innovation and competitiveness. Furthermore, suggestions and recommendations will be presented by this research so as to support the construction firms overcome their problems and improve their innovation and competitiveness.

These are the research questions of this study:

1. What are the most important factors affecting the innovation and competitiveness in Kurdistan Region of Iraq construction companies?
2. How do the above factors affect the construction company's work in Kurdistan Region of Iraq?
3. What will be the benefits of these factors?

IV. RESEARCH METHODOLOGY

The research begins by studying a large number of factors affecting innovation and competitiveness for the construction firms' word wide, then a collection of the most related factors affecting innovation and competitiveness to the region of Kurdistan Region of Iraqis selected. A questionnaire is created based on the selected factors, and sent to local construction firms in the form of hardcopies and online forms. The 150 firms have been surveyed, 70 from hardcopies and 80 from online forms, out of which 85 firms replied with the answers making the response rate 57%.

Data analysis is performed on the collected data by examining the specified factors. Followed by developing four hypotheses presenting the factors affecting project performance, innovation and competitiveness for the construction firms.

Statistical Package of Social Sciences (SPSS) and MS Excel software are used to analyse data, Relative Importance Index (RII) is utilized to rank the factors according to their importance to variables. Pearson correlation factors for each of the variables are determined to examine how factors are linearly correlate to each other and a conceptual framework for the developed hypotheses is presented. Finally, hypotheses testing is performed for the developed hypotheses so as to ensure the validity of the developed hypotheses.

4.1 THE QUESTIONNAIRE

The questionnaires aimed to collect the appropriate answers for the factors which are asked through the form. The main aim of the target response was to explain the relationship between the factors those are connected to competitiveness with innovation. The contents of the questionnaire, which can be seen from [13], contains two portions. The first one is associated to innovation. The second one is for competitiveness. Furthermore, the first part consists of two subparts, general information and innovation questions, and they have been written in English and Arabic languages. The questionnaire contains 49 questions, grouped into two parts A and B:

The part A consists of two parts, the first one is organized to examine over-all info of answers with experience. The key goal from asking the company about their

https://dx.doi.org/10.22161/ijaers.4.2.31 *ISSN: 2349-6495(P) | 2456-1908(O)*

information was to make an appropriate profile of the respondent companies in Kurdistan Region of Iraq. The demographic evidences about the companies are grouped by seven questions about the name of the company, the years that companies have been in the sector of construction, areas of expertise, and the type of projects that executed by each company as well as the total annual turnover of the company. The number of employees in the company has been asked and the job title of the respondent. Finally, they are asked if they satisfy about the importance to follow such innovate system in their company's work. The second subpart *consists* of 24 questions about five different variables of innovation: Inputs, Drivers, Barriers, Enablers, and Impacts.

Part (B) consists of 18 questions that have been asked to indicate the role of competitiveness and it's relation with the innovation in contracting companies in Kurdistan Region of Iraq.

V. RESULTS

5.1 DEVELOPED HYPOTHESES

Based on the results of data analysis, the following hypotheses are provided for both Innovation and Competitiveness for construction companies in Kurdistan Region of Iraq:

Based on the results of data analysis, the following hypotheses are provided for both Innovation and Competitiveness for construction companies in Kurdistan Region of Iraq:

Hypothesis 1: Construction companies activating their inputs, drivers, and impacts of innovation can improve their project performance.

Hypothesis 2: Construction companies activating their inputs, drivers, and impacts of innovation can increase their competitive advantages.

Hypothesis 3: Construction companies stimulating enablers can improve their project performance.

Hypothesis 4: Construction companies unable to overcome barriers cannot improve their project performance.

5.2 HYPOTHESES TESTING

The data has been collected from questionnaires distributed to 150 construction firms. 85 firms have replied with results making the response rate 57%. From these results hypotheses testing is performed.

Table.1: T-Test results for the developed hypotheses

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the				
				Lower	Upper			
Input - Project Performance	-0.261	0.96302	0.10445	-0.4689	-0.0535	-2.5	84	0.014
Driver - Project Performance	0.1289	0.62041	0.07755	-0.0261	0.28388	1.662	63	0.101
Impact - Project Performance	-0.174	0.87968	0.09542	-0.3633	0.01621	-1.82	84	0.073
Input - Competitiveness	0.1937	0.8409	0.09121	0.01235	0.3751	2.124	84	0.037
Driver - Competitiveness	0.4755	0.83877	0.09098	0.29457	0.65641	5.226	84	0
Impact - Competitiveness	0.2814	0.77441	0.084	0.11434	0.44841	3.35	84	0.001
Enabler - Project Performance	0.0893	0.67415	0.07784	-0.0658	0.24444	1.148	74	0.255
Competitiveness - Project Performance	-0.455	0.65068	0.07058	-0.5953	-0.3146	-6.45	84	0
Barrier - Competitiveness	0.5219	0.92514	0.11845	0.28492	0.7588	4.406	60	0
Barrier - Project Performance	-0.371	0.9682	0.10502	-0.5794	-0.1618	-3.53	84	0.001

5.2.1 TESTING HYPOTHESIS 1

Data analysis shows that, 66 firms who have selected high scales for input factors, their project performances are high. Therefore, the firms that considering the input dimension is essential for the innovation, they have an improved project performance. For the driver dimension, the results of data reveals that 64 construction firms having high driver's scales, have high project performance, which means that, the construction sectors paying attention for driver dimension, have high performance in their projects. Similarly, 69 construction firms having high impact in their scales, have high project performance. This also means that, the firms which care for their impacts, have excellent project performance. Thus, from the results in the Table.1, it can be concluded that hypothesis 1 is definitely true. Hypothesis 1 testing is highlighted with light blue color in the table.

5.2.2 TESTING HYPOTHESIS 2

In the results of the survey, 58 construction firms have given high ranges to input factors. These firms have been found with high competitive advantages. In the same way, it has been discovered from the results, 58 of the construction firms having high scales of drivers, have high scale of competitiveness. Similarly, the firms with high values of impact factors, have high values of competitiveness. The statistical information can be seen

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from the Table.1. Therefore, the facts in the table ensures the validity of the hypothesis 2.

5.2.3 TESTING HYPOTHESIS 3

Data analysis discovered that 75 of the firms that gave high metrics to enabler dimension, have high project performances. On the other side, 58 of the construction firms having high competitiveness have high project performance. The two aforementioned evidences confirm the correctness of hypothesis 3. The yellow colored rows in the Table.1 illustrate the statistical data for testing hypothesis 3.

5.2.4 TESTING HYPOTHESIS 4

61 of the firms in the questionnaires gave high scales to barrier factors, which means that they consider these factors as obstacles and eventually avoid them. The firms with high scales of barriers, have high competitive advantages. The same way, 61 of the firms who have high barrier scales have high project performance. Therefore, these analysis details approves hypothesis 4. The statistical details for hypothesis 4, which are highlighted with green color, are shown in the Table.1.

5.3 CONCEPTUAL FRAMEWORK

From the conceptual framework of innovative system and competitiveness in construction industry, which is illustrated in *Fig. 1*, it can be noticed that activating the factors of input, driver and impact, affect positively on project performance of the construction firms. While by stimulating enablers' factors and competitiveness dimensions, results in improving the competitive advantage of the construction sectors.

The factors of the variables inputs, drivers and impacts, have positive influences on increasing the firms' competitive advantages, which means by activating these variables, the competitive advantages improve proportionally.

The barriers dimension of the companies, have negative affect on both of project performance and competitiveness. So, without overcoming the current barriers, the construction firms are incapable of improving the project performance and competitive advantages.

From the Table.1, it can be ensured that the input dimension has a positive effect on project performance of the companies and competitiveness at the same time. The significance P-value for input to project performance is 0.14 which is less that 0.05 (1-confidence level), similarly, the P-value of input to competitiveness is 0.073 which is also less than 0.05. As a result, these values ensures that input dimension affect both of project performance and competitiveness.

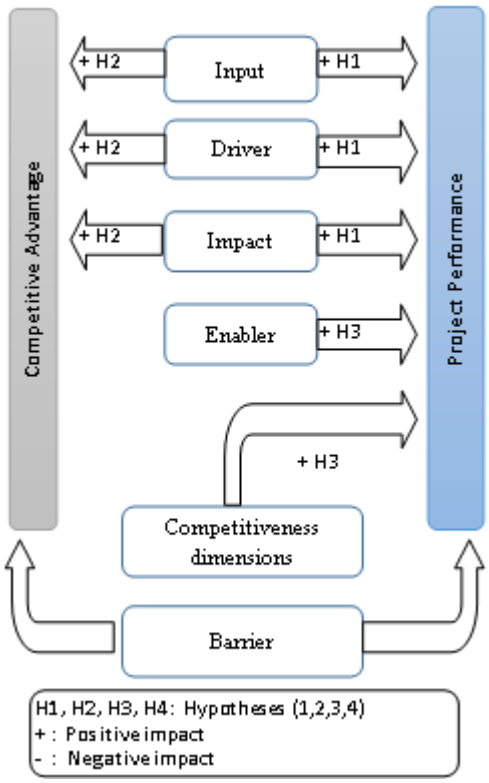

Fig. 1: Conceptual framework of developed hypotheses for construction industry

Driver dimension affect directly to both of the project performance and competitiveness. As it is shown in Table.1, P-value of driver to project performance is 0.101, which is statistically accepted to be considered as a confidence level, and P-value of driver to competitiveness is 0, which is a strong confidence level. Therefore, both of the values are statistically accepted to consider the driver dimension effect on project performance and competitiveness.

Impact dimension has a positive influence on both of project performance and competitiveness. It can be seen from the Table.1, the P-values of both impact-project performance and impact-competitiveness are 0.073 and 0.001 respectively. These values are less than confident value which means that the impact dimension affect positively on both project performance and competitiveness.

Enabler and competitiveness dimensions, have positive influence only on project performance. The Table.1 illustrates that P-values of enabler and competitiveness to project performance are 0.255 and 0.0 respectively. These values confirms the effect of these dimensions on project performance.

While barrier dimension affect negatively to competitiveness and project performance. The P-values of the dimension to both of competitiveness and project performance shows that they are less than 0.05, or the confident level. This means that when the barrier

https://dx.doi.org/10.22161/ijaers.4.2.31 *ISSN: 2349-6495(P) | 2456-1908(O)*

dimension increases in a company, the competitiveness and project performance decrease for that company.

VI. CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

Innovation is the key success of any firm worldwide, competitiveness is the organizations' ability of providing services with standard qualities at competitive costs. A collection of factors effecting innovation and competitiveness have been studied and selected forming a group of dimensions for innovation and competitiveness. Based on these dimensions, a structured questionnaire survey approach was considered to study the impact of various attributes and factors affecting innovation and competitiveness for construction industry, and distributed to experienced engineers such as projects managers, site engineers and office engineers in Kurdistan Region of Iraq.

Forty three factors were considered in this study and were listed under seven dimensions based on literature review. The dimensions considered in this research are: 1) input, 2) driver, 3) barriers, 4) enabler, 5) impact, 6) competitiveness, and 7) firm's need of innovation.

150 questionnaires were distributed and 85 questionnaires (57%) were received. The results were analyzed and discussed to obtain the most factors affect innovation and competitiveness, followed by developing four hypotheses outlining the improvements of project performance of the construction firms and their competitive advantages.

A conceptual framework describing the developed hypotheses are designed, ended up with exposing two main theories: 1) through stimulating the variables of innovation such as inputs, drivers, enablers and impacts, the competitive advantages and project performance of construction sectors increase; 2) the construction sectors unable to overcome barriers are unable to increase their project performance and competitiveness.

The following recommendations are presented so as to improve project performance, innovation and competitiveness for construction industry in the region:

1. The most important factors agreed by participants to be improved for innovation are listed below:
   i. R&D expenditure and R&D projects
   ii. Short and long term profitability
   iii. Number of employees who devote to innovation
   iv. Financial constraint
   v. Government policy
2. The most significant factors for competitiveness agreed by respondents to be improved are the following:
   i. Intellectual property (patents, brand registration)
   ii. R&D
   iii. Internationalization
   iv. Strategic management plans
   v. Pioneering leaders
3. Managers and employees of firms are recommended to organize regular meetings so as to discuss, monitor and control the progress of projects. These meetings further help them to evaluate current performance, overcome existing problems and improve the future work.
4. Kurdistan Region of Iraq government should be aware of financial shortages in the construction industry sector to help them apply the innovation system.
5. In order to improve the managerial skills at firms, there is need for continuous work-training programs for personnel in the industry to update their knowledge and be familiar with project management techniques and processes.

6.2 RECOMMENDATIONS FOR FURTHER STUDY

Failure measurement systems for the construction industry in Kurdistan Region of Iraq are not effective to measure construction projects performance and identify their problems. Therefore, it is highly recommended to develop performance measurement framework and modelling system in order to measure performance of construction organizations and projects. Furthermore, it is recommended to develop a specific unit in all construction firms so as to encourage the innovation. Finally, it is also recommended to investigate and evaluate the most essential factors such as R&D expenditure and R&D projects, number of employees devoting to innovation and strategic management plans as a case study of construction projects in Kurdistan Region of Iraq.

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